

WHAT IS CLAIMED IS:

1                   1.       A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                   modeling a set of teeth in a predetermined position; and  
4                   generating a plurality of one or more appliances having cavities, said  
5 appliances having cavities and wherein the cavities of successive ones of the plurality  
6 appliances have different geometries shaped to receive and resiliently reposition teeth from  
7 one arrangement to a successive arrangement.

1                   2.       A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                   modeling a set of teeth in three or more predetermined positions; and  
4                   generating an appliance having cavities for each of the three or more  
5 predetermined positions, said appliance having cavities and wherein the cavities of successive  
6 ones of the plurality appliances have different geometries shaped to receive and resiliently  
7 reposition teeth from one arrangement to a successive arrangement.

1                   3.       A method for fitting a set of upper and lower teeth in a masticatory  
2 system of a patient, comprising:

3                   modeling a set of teeth using three or more predetermined molds or casts; and  
4                   generating an appliance having cavities for each of the three or more molds or  
5 casts, said appliance having cavities and wherein the cavities of successive ones of the  
6 plurality appliances have different geometries shaped to receive and resiliently reposition  
7 teeth from one arrangement to a successive arrangement.

1                   4.       The method of any of claims 1-3, wherein the modeling the set of teeth  
2 comprises selecting one or more arch forms specifying the ideal set of teeth.

1                   5.       The method of claim 4, wherein the masticatory system includes jaws  
2 and wherein generating includes:

3                   registering a model of the upper and lower teeth with a model of the  
4 masticatory system;

5                   simulating the motion of the jaws to generate contact data between the upper  
6 and lower teeth; and

7                   placing a tooth in a final position based on the contact data.

- 1                    6.        The method of claim 5, wherein the model is registered using X-ray  
2    data.
- 1                    7.        The method of claim 5, wherein the model is registered using  
2    computed tomography data.
- 1                    8.        The method of claim 5, wherein the model is registered using data  
2    associated with a mechanical model.
- 1                    9.        The method of claim 5, wherein the simulating step further comprises  
2    applying kinematics to the model of the teeth.
- 1                    10.      The method of claim 5, wherein the simulating step further comprises  
2    applying a constrained motion to the model of the tooth.
- 1                    11.      The method of claim 5, wherein the placing step is based on a measure  
2    of undesirability to the contacts.
- 1                    12.      The method of claim 11, further comprising optimizing the position of  
2    the tooth according to the measure of undesirability.
- 1                    13.      The method of claim 12, further comprising minimizing the measure of  
2    undesirability.
- 1                    14.      The method of claim 13, wherein the measure of undesirability is a  
2    function of one or more of Peer Assessment Rating (PAR) metrics, distance-based metrics  
3    and shape-based metrics.
- 1                    15.      The method of claim 5, wherein the simulating step includes providing  
2    a library of motions.
- 1                    16.      The method of claim 15, wherein the library of motions includes a  
2    protrusive motion.
- 1                    17.      The method of claim 15, wherein the library of motions includes a  
2    lateral motion.

1                    18.     The method of claim 15, wherein the library of motions includes tooth-  
2 guided motions.

1                    19.     The method of claim 5, wherein the simulating step includes applying  
2 physical forces to one jaw.

1                    20.     The method of claim 5, wherein the placing step further includes  
2 updating the computer representation of the masticatory system with new patient data.

1                    21.     The method of claim 20, wherein the patient has a first teeth model,  
2 further comprising:  
3                    scanning the teeth of the patient to generate a second teeth model;  
4                    matching the second teeth model with the first teeth model;  
5                    applying a final position transform to the second teeth model; and  
6                    adjusting the position of teeth in the second model based on new information.

1                    22.     The method of claim 21, wherein the matching step compares  
2 correspondences between the first and second teeth models.

1                    23.     The method of claim 22, wherein the correspondences include feature  
2 correspondences.

1                    24.     The method of claim 21, wherein the new information includes  
2 information from a new prescription.